DISSERTATION

FOR THE AWARD OF DEGREE

MASTER OF SCIENCE

In the Specialty of

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SESSION 2021-2024

Topic: MORPHOLOGICAL AND MORPHOMETRIC ANALYSYS OF MENTAL FORAMEN UTILIZING VARIOUS ASSESSMENT PARAMETERS IN DRY HUMAN MANDIBLES FROM NORTH INDIA

By

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DEPARTMENT OF ANATOMY

SANTOSH DEEMED TO BE UNIVERSITY

NO. 1, SANTOSH NAGAR, GHAZIABAD-201009,

DELHI NCR, INDIA

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Dated: _____

Place: Ghaziabad ***(Dr. Anjali Jangid)***

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INTRODUCTION

INTRODUCTION

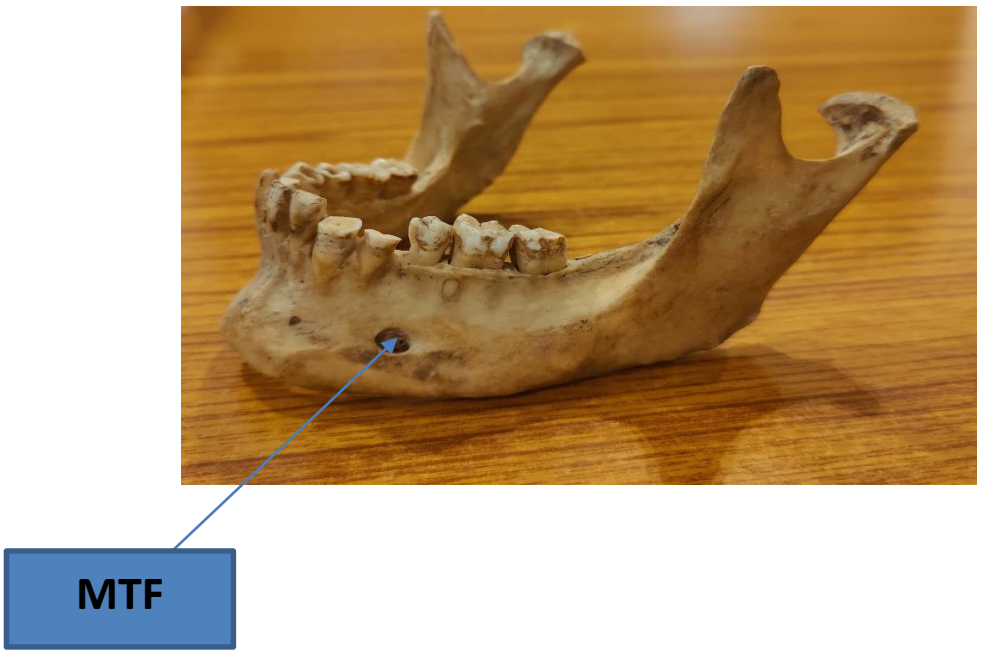
The Mental foramen [MTF] is an important landmark in the human mandible (lower jaw) as it serves as opening for important nerves and blood vessels that supply the teeth and surrounding structures. The mental foramen is located on the anterior surface of the mandible and is the opening for the mental nerve and vessels.[1]

The mandible, or lower jaw, is the most substantial bone in the human skull. It plays a crucial role in securing the lower teeth, aiding in chewing, and shaping the jawline. Structurally, the mandible consists of the body and the ramus, positioned beneath the maxilla. Notably, the mental foramen, which allows the passage of the mental nerve and blood vessels, is situated below the space between the premolar teeth or directly beneath the second premolar. The smooth posterior edge of the foramen provides a pathway for the nerve, which exits in a posterolateral direction.

The body of the mandible is a horizontally curved section that forms the contour of the lower jaw. Flanking this body are the rami, two vertical extensions that connect at the mandible's angle. At the top of each ramus, the coronoid and condylar processes meet the temporal bone, forming the temporomandibular joint, which allows for movement of the jaw.

The mental foramen of the mandible is located on the anterolateral side of the body, positioned below the space between the premolar teeth, roughly equidistant from the upper and lower edges of the mandible. On both sides, it is found on the buccal cortex of the mandibular bone, near the tips of the premolars. Research indicates that it is typically situated at a consistent height in most individuals, approximately 13 to 15 millimeters above the mandible's inferior border, serving as a passage for the mental nerve and blood vessels.

The mental nerve serves as the terminal branch of the inferior alveolar nerve, providing sensory innervation to the lower lip, the buccal vestibule, and the gum tissue adjacent to the first mandibular molar. Accurately identifying the mental foramen is crucial for dental surgeons during various procedures involving the mandible. This includes treatments such as premolar curettage, filling procedures, dental implants, root canal therapy, orthognathic surgeries, pre-prosthetic interventions, and flap operations in the lower teeth area.



Mental foramen

Male mandible

Statement of problem

Clinical investigations of the shape and position of the mental foramen is important for several reasons. First, knowledge of the exact location of this foramen is critical for successful anaesthesia of the mandibular teeth and surrounding structures, particularly during dental procedures. Accurate identification of the mental foramen is also important during surgical procedures in the mandible, such as implant placement, as damage to the nerves and vessels that pass through these foramina can result in significant complications.[2]

Additionally, variations in the shape and position of the mental foramen can occur in different individuals, which can impact the success of anaesthesia and surgical procedures. For example, in some individuals, the mental foramen may be located higher or lower than expected, or they may be smaller or larger than normal. Therefore, understanding the anatomical variations in the shape and position of this foramen is essential for accurate diagnosis, treatment planning, and execution of dental and surgical procedures.

In summary, clinical investigations of the shape and position of the mental foramen are important for successful anaesthesia and surgical procedures, and for understanding anatomical variations that can impact treatment outcomes. The mental foramen is a tiny hole on the mandible's exterior that permits the mental nerve and blood vessels to pass through. The present investigation employed samples of dried mandibles rendered from Northern India and which was further subjected to assessment in terms of measuring/ determining the shape and position of the mental foramen.

Importance of the study

The findings could greatly facilitate the assessment of the shape and position of the mental foramen, consistent with previous studies in other populations. The researchers recommended that dental and surgical practitioners should be mindful of these anatomical variations when conducting procedures in this region. Overall, this study offers crucial insights into the anatomy of the mandible in northern India and underscores the importance of considering individual anatomical differences in medical and dental procedures.

From a medical anatomy standpoint, investigating the shape and position of the mental foramen holds significant importance. This foramen serves as openings for critical nerves and blood vessels that supply the teeth and surrounding structures of the lower jaw.

Accurate identification and understanding of the anatomical variations of this foramen are indispensable in various medical fields, including dentistry, oral and maxillofacial surgery, neurosurgery, and head and neck surgery. For instance dentists and oral surgeons must be aware of the precise location of the mental foramen to ensure successful anesthesia and perform procedures such as tooth extraction, implant placement, and bone grafting.

In dentistry, the inferior alveolar nerve block is a frequently used local anesthetic method, yet failure rates can reach 20% to 25%. The primary cause of the failure is erroneous mental foramen location.

Furthermore, knowledge of the position and shape of this foramen is crucial for neurosurgeons and head and neck surgeons performing procedures involving the mandible or adjacent structures. Damage to the nerves and vessels passing through this foramen can result in significant complications such as nerve injury, bleeding, or infection. Moreover, understanding the anatomical variations of this foramen can assist in diagnosing and treating conditions affecting the lower jaw and its surrounding structures.

In conclusion, the shape and position of the mental foramen are pivotal from a medical anatomy perspective due to its critical role in the function and innervation of the lower jaw and surrounding areas. Accurate identification of this foramen is imperative for successful surgical outcomes, and awareness of anatomical variations can facilitate the diagnosis and treatment of conditions affecting the lower jaw.[3]

AIM AND OBJECTIVES

Aims & Objectives

AIM:

To establish the clinical significance of position and shape of the mental foramen in inferior alveolar nerve block**.**

OBJECTIVES:

1. To ascertain the mental foramen's location and form.

2. To contrast the location and form of the mental foramen on the left and right sides.

3. To determine precise location of mental foramen from various anatomical landmarks.

Hypothesis –

1. To determine precise location of mental foramen [MTF] from various anatomical land marks such as alveolar crest, symphysis menti, posterior border of ramus of mandible and mandibular base and also from apex of the second premolar teeth.

2. To determine shape of mental foramen on right and left sides in male and female.

Research methodology: Observational study.

Research tools:

1. Interviews
2. Focus group discussion
3. Observation
4. Survey
5. Photography

Limitation of the study: This study was conducted in adult dentulous dried mandibles those are regular in shape and without deformities, with fossa for third molar teeth, no age categorization, children data is not available.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Anatomical overview of mandible:

The largest bone in the human skull is the mandible. It creates the lower jawline, helps with mastication, and secures the lower teeth in position. The mandible is situated beneath the maxilla and is made up of the body and the ramus. The lower jawline is formed by a section of the body that curves horizontally. The rami are two vertical processes that connect to the body at the mandibular angle. They are situated on either side. The coronoid and condylar processes engage with the temporal bone at the superior aspect of each ramus to form the temporomandibular joint, which allows for movement.

The mandible is the sole moveable skull bone, aside from the ear ossicles, which enables the bone to aid in mastication. The first pharyngeal arch develops into two processes that finally unite at the mandibular symphysis to create the jaw. Fibrocartilage makes up the mandibular symphysis during birth. The symphysis merges within the first year of life, leaving a faint ridge near the anterior central axis aspect of the anatomy.

Structure & function:

The mandible consists of several components, including the body and two rami.

Body:

The body of the mandible is the front section and features two surfaces along with two borders. On each side, it transitions into the rami at the gonial angle, commonly referred to as the mandibular angle.

• **External surface:** The mandibular symphysis, which is seen as a subtle ridge in adults, is located on the external surface at the midline. A midline depression known as the mental protuberance is divided and enclosed by the inferior portion of the ridge. The mental tubercle is formed by the elevated margins of the mental protuberance. The incisive fossa is a depression located under the incisive teeth and laterally to the ridge. The mental foramen, where the mental nerve and blood vessels exist, is located beneath the second premolar.

• **Internal surface:** The mental spines, located directly lateral to the median ridge at midline, and the median ridge itself make up the internal surface. The alveolar border is reached by the mylohyoid line, which starts at the midline and moves superiorly and posteriorly.

• **Alveolar border:** The lower sixteen teeth are housed in hollow cavities that are located along the superior border, that is alveolar border.

• **Inferior border:** The facial artery travels through a narrow groove on the inferior border, which also forms the lower jawline.

Ramus:

The mandible's lateral portion on either side is augmented by the ramus. The superior aspect of the ramus is where coronoid and condyloid processes are located. The condyloid process is posterior and the coronoid process is anterior, and the notch in the mandible divides the two. The ramus has two processes and is surrounded by four boundaries and two surfaces.

• **Lateral surface:** Portion of the oblique line, which started on the body's exterior surface, is present on the lateral surface. The masseter muscle originates from this surface as well.

• **Medial surface:** The inferior alveolar nerve and artery enter the mandible through the mandibular foramen, found on the medial surface, and proceed along the mandibular canal. Situated at the antero-superior edge of the mandibular foramen is a prominent structure known as the lingula of the mandible. Additionally, the mylohyoid groove is located at the postero-inferior aspect of the mandibular foramen, where the mylohyoid vessels run alongside it.

• **Superior border**: The coronoid and condyloid processes originate from this superior border.

• **Inferior border**: This border contributes to the jawline and is connected with the inferior border of the mandibular body.

• **Posterior border**: The posterior and inferior borders of the ramus form a continuous line that extends deep beneath the parotid gland. This border merges with the inferior border of the mandibular body, creating the gonial angle.

• **Anterior border:** The oblique line of the body's exterior surface and the anterior border are continuous.

Coronoid Process:

Located at the superior side of the ramus is the coronoid process. The mandibular notch's anterior boundary is formed by its posterior border, which forms the continuity between it and the ramus' anterior border. The lateral surface of it is where the masseter and temporalis muscles insert.

Condyloid Process:

At the upper part of the ramus is the condyloid process, which consists of two sections: the neck and the condyle. The neck is the narrower segment that extends from the ramus, while the condyle, located at the top, plays a crucial role in the temporomandibular joint by articulating with the articular disc.

Blood Supply:

The mandible receives its blood supply from tiny periosteal and endosteal arteries. The mandibular ramus is supplied by the periosteal vessels, which mostly emerge from the inferior alveolar artery. The peri-mandibular branches of the superficial temporal artery, maxillary artery, facial artery, and external carotid artery feed blood to the mandible's body, giving rise to the endosteal arteries. Dental branches from the inferior alveolar artery supply the mandibular teeth.

Nerves:

The main nerve linked to the jaw is the inferior alveolar nerve, which is a branch of the mandibular division of the trigeminal nerve. After it exits the mandibular foramen, this nerve moves forward into the mandibular canal, where it sends branches to the lower teeth for sensory function. At the mental foramen, the inferior alveolar nerve divides into the incisive and mental nerves. The mental nerve, which emerges from the mental foramen and ascends, supplies sensation to the lower lip. In contrast, the incisive nerve continues through the incisive canal to provide innervation to the mandibular premolars, canines, and both lateral and central incisors.

Anatomy of mental foramen[4]

The mandible, or lower jaw bone, has a tiny, oval-shaped aperture on its facial surface that is known as the mental foramen. Though its exact location may differ from person to person, it is usually found between the first and second premolars or close to the apex, or tip, of the second premolar tooth. Since the mental nerve and blood vessels leave the jaw here to bring sensation and blood flow to the chin, lower lip, and adjacent tissues, the mental foramen is a significant anatomical landmark in dentistry, oral surgery, and radiology.

The outermost surface of the mandible is formed by a thick layer of cortical bone that encircles the mental foramen. The mandible receives strength and stability from the densely packed, mineralized bone tissue that makes up the cortical bone. Age, sex, dental health, and other variables can all affect the thickness of the cortical bone. It can also be impacted by bone resorption, osteoporosis, and tooth loss.

A thin layer of cancellous bone, which has a spongy texture and many tiny, linked gaps, surrounds the mental foramen inside the cortical bone. In comparison to the cortical bone, the cancellous bone is less dense and has a higher concentration of blood vessels and bone marrow, both of which are crucial for bone metabolism and repair.

One of the main sensory nerves in the face, the trigeminal nerve, has a mandibular division that includes the mental nerve. Sensation to the lower jaw, teeth, and gums, as well as the skin and mucous membranes of the lower lip, chin, and portion of the cheek, is supplied by the mandibular division of the trigeminal nerve. As it extends along the inferior border of the mandible and supplies sensory innervation to the lower teeth and gums, the inferior alveolar nerve gives rise to the mental nerve. From the mandibular foramen at the back of the mandible to the mental foramen at the front, a small canal known as the mandibular canal allows the mental nerve to pass through the mandible.

The mental nerve leaves the mandible at the mental foramen, where it splits into multiple branches that supply sensation to the skin and mucous membranes around the chin, lower lip, and surrounding areas. These branches are crucial for dental procedures like local anaesthetic and root canal therapy as they also supply sensory innervation to the gingiva, or gum tissue, of the lower teeth.

In conjunction with the mental nerve, the inferior alveolar artery gives rise to the mental artery, which exits the mandible through the mental foramen. This artery is vital for supplying blood to the lower lip, chin, and adjacent tissues. Because the structure of the mental foramen is crucial to the blood supply and sensation to the lower lip, chin, and surrounding areas, it is significant in the fields of radiography, dentistry, and oral surgery. Therefore, it is crucial to comprehend the position and architecture of the mental foramen in order to perform dental procedures safely and effectively and to interpret radiographic images of the mandible.

Structure and functional attributes of mental foramen[5]

The mental foramen is a small opening on the facial surface of the mandible, or lower jaw bone that plays a critical role in the sensory and vascular supply of the lower lip, chin, and surrounding areas. The structure and function of the mental foramen are closely interconnected and can be explored in more detail as follows:

Structure:

The precise position of the mental foramen varies from person to person, but it is usually found between the first and second premolars or near to the apex, or tip, of the second premolar tooth. It is oval and has a diameter of roughly 4-6 mm. A thick layer of cortical bone, that forms the mandible's exterior, and a thin layer of cancellous bone, which has a spongy texture and many small, linked voids, encircle the mental foramen. Inside the mental foramen, the mental nerve and Blood vessels exit the mandible to supply sensation and blood flow to the lower lip, chin, and surrounding tissues.

Functional roles:

The mental foramen serves several important functions, including:

- Sensory innervation: One of the main facial sensory nerves, the trigeminal nerve's mandibular division gives rise to the mental nerve. The skin and mucous membranes of the lower lip, chin, and part of the cheek, as well as the gingiva of the lower teeth, are all sensed by the mental nerve. The mental nerve divides into several branches that provide sensation to these locations after leaving the jaw through the mental foramen.
- Vascular supply: The inferior alveolar artery, a significant blood vessel that runs along the inferior border of the mandible, is the branch of the mental artery. Through the mental foramen, the lower lip, chin, and surrounding tissues receive blood supply from the mental artery. It is a significant source of blood flow to these regions and is essential to preserving their health and vitality.
- Dental procedures: The mental foramen, which is where the mental nerve and blood vessels leave the jaw to provide sensation and blood flow to the lower lip, chin, and surrounding tissues, is a significant landmark in oral surgery and dentistry. For dental treatments like local anaesthesia, root canal therapy, and implant insertion to be performed safely and effectively, a complete understanding of the location and architecture of the mental foramen is necessary.

In conclusion, the mental foramen is a small but significant structure in the jaw that is essential to the vascular and sensory supply of the chin, lower lip, and surrounding regions. Interpreting radiographic images of the mandible and performing safe and efficient dental operations require a complete understanding of its anatomy and location.

Major Literature investigations associated with determination of shape and size from the anatomical standpoint on mental foramen:

A review of the literature from the past few years shows that the mandible has been the subject of multiple research that show how effective it is at determining sex. The literature provides a quick overview of the key studies and publications on the numerous morphological characteristics of the mandible.

Kadanoff et al [6] In the study, there were a range of mental foramina: none, two, three, equal, unequal, close together, far apart, or even more, all arranged in a cluster.

According to **Gershenson et al's**[7] in a study examining 525 dry mandibles, researchers focused on the variation, shape, and location of the mental foramen in relation to the teeth. The findings revealed that 4.3% of the mandibles featured double mental foramina, while 0.7% had triple foramina. Notably, one mandible exhibited four mental foramina on a single side, accounting for 0.1% of the sample.

Serman[8] In his examination of 408 dry human mandibles, discovered bilateral double mental foramina in two specimens and one additional foramen on one side in seven mandibles, or 1.7% of the total. On 408 mandibular specimens (2.7%), a total of eleven double mental foramina were recorded.

Singh et al[9] discovered that the mental foramen's average distance from the mandibular lower border was 14 mm.

In Thailand, Stithipon[10] Only two (1.8%) of the 110 mandibles that he and his colleagues examined possessed double mental foramina.

Kim [2006][11], **Apinhasmit et al** found that the mental foramen's and the mandible's mean distances were, respectively, 14.33 and 14.88 mm.

According to **Gingor's**[12] research from Turkey 42, in 71.5% of cases, the mental foramen's most common location was between the two anterior teeth (Type -3). According to Fabian 8, the mental foramen is positioned type -5 in 35% of mandibles and type -4 in 45% of mandibles.

According to **Yesilyurt et al**[13] the average distance of the mental foramen from the lower border of the jaw was measured at 9.4 mm on both sides. It was most Commonly located in the spaces between the premolars (Type 3) and directly below the second premolar (Type 4), occurring in 55–60% of the cases.

.**Haghanifar and Rokouei**[14] According to their radiological analysis of the mental foramen, 47.2% of cases showed that the mental foramen was most frequently located between the two premolars (Type 3)

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Ilayaperuma et al[15] discovered that in 52.94% of the mandibles, the type 4 mental foramen was positioned in relation to the lower teeth, while in 26.47% of the mandibles, the type 3 location was detected.

The most common location of MF, according to **Olasoji et al**[16], was between the first and second premolars, followed by the second premolar's apical position. The ratios of distances from the symphysis menti and the posterior border of the mandibular ramus to the mental foramen (MF) were found to be 1:3.2. According to Wang et al., the measurements for adult Chinese mandibles show a separation of 28.06 mm from the mandibular fundus to the symphysis menti, 74.14 mm from the mandibular fundus to the posterior border of the mandible, and 14.70 mm from the mandibular base to the MF.

Marzola & Freitas[17] The distance between the mental foramen (MF) and the mandibular base was found to be 13–15 mm. In males, the MF was measured at 14.89 mm above the base of the jaw and 16.16 mm below the alveolar ridge. In females, the measurements were 14.21 mm above and 15.66 mm below the alveolar ridge.The distance between the mental foramen (MF) and the mandibular base was found to be 13–15 mm. In males, the MF was measured at 14.89 mm above the base of the jaw and 16.16 mm below the alveolar ridge. In females, the measurements were 14.21 mm above and 15.66 mm below the alveolar ridge.

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According to **Souaga et al's**[18] A study involving 61 dry mandibles revealed that the average distance from the symphysis menti to the mental foramen (MF) was 19.18 mm on the right side and 19.37 mm on the left side.

According to **Yes ilyurt et al**[19] On the right side, the average distance from the mental foramen (MF) to the posterior border of the ramus was measured at 48.58 mm, whereas on the left side, it was 48.27 mm.

Literature investigation concerning the shape showcased that as per **Mbajiorgu et al**[20], In an analysis of 32 mandibles from Black adults in Zimbabwe, the morphology of the MF was observed to be round in 14 specimens (43.8%) and oval in 18 specimens (56.3%).

According **to Oliveira Junior et al**[21]**,** Of the 59 mandibles (73.8%) exhibiting an oval shape on the right side, and 57 mandibles (71.3%) on the left side, it was noted that 98.3% of the right-side mandibles had a greater diameter horizontally, while only 1.7% had a larger vertical diameter. All oval foramina on the left side also demonstrated a greater horizontal diameter. There were 21mandibles (26.2%) on the right side and 23 mandibles (28.7%) on the left side that were round in shape.

According to **Al-khateeb et al,** The findings suggest that, similar to the current study, the majority of mental foramina were round in shape. In terms of size, Chung et al. reported that the horizontal opening of the mental foramen was 2.4

mm, while Apinhasmit et al. found an average horizontal opening of 2.8 mm.

Thakur M and associates[22] A radiographic study analyzed panoramic radiographs of 102 dentulous patients to determine sex based on the height of the mental foramen. This research focused on measurements from the right side of the orthopantomograph in dentulous patients. The sample was categorized into three age groups: under 25 years, 25 to 50 years, and over 50 years. Digital measurements were taken, and the collected data were organized into tables and subjected to statistical analysis.

Santini and I.Alaya[23] The study examined the position of the mental foramen in relation to the mandibular teeth and anatomical landmarks across 76 Chinese, 46 European, and 33 Indian skulls with known or estimated ages at death. The results showed that the length of Indian mandibles was smaller compared to those of Europeans and Chinese. The researchers proposed that the assumption that the mental foramen consistently lies between the first and second molars is no longer universally valid. Notable population differences were identified, highlighting the importance of obtaining preoperative radiographs.

Pelé et al[24] The study aimed to evaluate whether cone beam computed tomography (CBCT) could effectively assess the anatomy of the mental foramen prior to human implantation. A systematic review was conducted to analyze various anatomical features of the mental foramen, including size, position, symmetry, anterior loop, and the presence of accessory or multiple

foramina. It was found that the mental foramen was typically located apically to the second premolar (in 50.3% to 57.9% of cases) or between the two premolars (in 50.4% to 61.95% of cases). Males exhibited a greater mean diameter of the mental foramen compared to females, with a difference of up to 0.62 mm. Additionally, the anterior loop was generally longer in males (ranging from 0.87 ± 1.81 to 7.25 ± 2.02 mm) than in females (ranging from 0.81 ± 1.18 to 6.52 ± 1.63 mm). The presence of teeth also influenced measurements, with dentate individuals showing an anterior loop size between 0.91 ± 1.18 and 2.55 ± 1.28 mm, while edentate individuals had measurements ranging from 0.25 ± 0.61 to 2.40 ± 0.88 mm. Understanding the location, morphology, and anatomical variations of the mental foramen is crucial for local anesthesia, surgical procedures, and implantology to prevent mental nerve injury.

According to the study by **Greenstein and Tarnow**[25], a strategically significant marker during osteotomy procedures is the mental foramen. To prevent damage to the mental nerve during implant surgery, its placement and the potential presence of an anterior loop of the mental nerve medial to the mental foramen must be taken into account. The mental foramen can be round or oval, and it is often situated between the premolar apices or apical to the second mandibular premolar. On the other hand, it can be anywhere from the mandibular canine to the first molar. Conventional radiographs might not show the foramen, hence linear measures must be corrected for radiographic distortion. Conventional radiographs are less reliable than computerised tomography (CT) scans in identifying the mental foramen Guidelines were developed for accurately locating the mental foramen and identifying the presence of an anterior loop of

the mental nerve, based on existing literature. These measures aim to prevent nerve damage during surgical procedures in the foraminal region. The findings suggest that altered sensations in the lip can generally be avoided if the mental foramen is identified and utilized as a reference during surgery in this area.

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In a morphometric investigation of 22 Caucasian skulls, **Rodrigo F. Neiva et al**[26] assessed the mental foramen's height, width, and position in respect to other recognised anatomical landmarks. The anterior loop of the inferior alveolar nerve was found to be present or absent, and its mesial extent was assessed. It was discovered that the mental foramen's most common location in regard to teeth was below the mandibular premolar apices. With a mean length of 4.13 ± 2.04 mm, symmetric occurrences of the mental foramen were common (76.2%), and anterior loops were notably prevalent (88%). The study emphasized that the anatomy related to implants must be thoroughly assessed before treatment, as significant variations exist among individuals, which is essential to avoid injury to surrounding anatomical structures.

In a review of the literature, **Gintaras Juodzbalys et al**[27] discussed how to identify the mandibular incisive canal, mental foramen, and related neurovascular bundles during implant surgery, as well as how to prevent injury to these essential structures during implant therapy. There were a total of 47 literature reviews completed. These structures—the mandibular incisive canal, the mental foramen, and the related neurovascular bundles—have distinct morphologies, are found in diverse places, and exhibit a wide range of variability. The degree of edentulous alveolar bone atrophy, individual gender, age, race, and the method of assessment all have a significant impact on these differences. Prior to performing an implant surgery, it is recommended that professionals thoroughly identify these anatomical landmarks by assessing all relevant parameters.

Fereidoun parnia et al[28] A study was conducted to assess the appearance, visibility, location, and trajectory of anatomical landmarks in the mandibular interforaminal region using cone beam computed tomography (CBCT) on 96 patients. The researchers concluded that recommending a specific medial distance from the mental foramen is not advisable. Instead, they emphasized the importance of individually evaluating the diameter of the canals and foramen to determine the optimal location for each patient.

Hasan T, Fauzi M, Hasan D[29] A rare anatomical variation of bilaterally absent mental foramina was reported. Nandy Apurba noted that males typically exhibit an everted angle, greater symphyseal height, and a broader ascending ramus,

while females tend to have an inverted angle, reduced symphyseal height, and a narrower ascending ramus.A rare anatomical variation of bilaterally absent mental foramina was reported. Nandy Apurba noted that males typically exhibit an everted angle, greater symphyseal height, and a broader ascending ramus, while females tend to have an inverted angle, reduced symphyseal height, and a narrower ascending ramus.

Gagan Thakur, Shaji Thomas, Sumeeth Cyriac Thayil, Preeti Nair[30] A recurrence of pain was observed in a patient after undergoing peripheral neurectomy for trigeminal neuralgia, which was linked to the failure to perform neurectomy on the mental nerve branch that emerges from the accessory foramen.

According to the literature, the most common position of the mental foramen in British mandibles is between the first and second premolars, noted in 65% of cases. Furthermore, the foramen was found to be situated below the apex of the second premolar in 49% of the mandibles examined. by **Tebo & Telford**[31]**,** 58.98% by **Wang et al**[32] and 52.9% **Santini & Land**[33] **Aktebin et al**[34] mentioned that MF is located between the apices of two premolar

MATERIALS AND METHODS

MATERIALS AND METHODS

Research Materials

Study type: Observational study.

Study setting: The study was conducted in Santosh medical college, Ghaziabad (U.P.). Which was carried out in the department of anatomy.

Convenient sample size – 66

Note – Measured right and left side overall 132

Inclusive criteria: Mandibles without deformities, with fossa for third molar teeth.

Exclusion criteria: Mandibles with deformities.

Ethical Approval: Institutional ethical approval is obtained for the study.

Data collection: Data were collected from department of anatomy Santosh medical college, Ghaziabad (U.P.) after getting permission from head of the institution and departmental heads.

Research Material: Instruments which are used for this study

Digital Vernier calipers: with accuracy of 0.1mm used to measure distance of mandibular and mental foramen from different land marks.

Figure 3.1 Digital Vernier callipers

METHOD

Procedure of collecting data: The formula above was adjusted to account for 5% type 1 error, 20% relative precision, and 25% estimated proportion of inferior alveolar nerve block failure rate. 66 was the estimated minimum sample.

- **Cleaning and preparation:** After the mandibles are chosen, any soft tissue or debris should be removed and they should be cleansed and prepped. It is important to thoroughly examine the mandibles to make sure there are no fractures or other problems that could alter the foramen's position or shape. Mandibles that are broken or flawed ought to be excluded from the research.

- **Positioning of mandibles:** The mandibular symphysis should be parallel to the ground, and the mandibles should be positioned such that the occlusal plane is perpendicular to the floor. This will guarantee precise measurement of the foramen's shape and location. The mandibles can be held in place for the measurements using an appropriate stand or support. The detailed procedure governing with the mandibular positioning is as follows:

- Mandibles should be positioned on level surfaces and then adjusted so that the occlusal plane is perpendicular to the surface. To achieve this, gently push the mandible into its correct position.

- Verifying that the mandibular symphysis is positioned parallel to the surface is crucial for the observer. One way to accomplish this is to place a flat instrument, such as a ruler, on the mandibular symphysis and make sure it is parallel to the surface.

    - Further then the mandible was secured in place. This can be done by using a clamp or by placing weights on the mandible to keep it in position.

- The position of the mandible was checked periodically during the study to ensure that it remains in the correct position.
- The process was later then repeated for each mandible that as the study sample.

The proper positioning of the mandibles is crucial since it will guarantee an accurate measurement of the foramen's shape and location. Measurements that are taken incorrectly can have an impact on the study's validity and reliability. The mandibles can be positioned regularly and precisely for investigating the mental foramen by according to this protocol.

Measurements: The position and shape of the mental foramen can be determined by taking various measurements. The measurements can be taken using a digital caliper. The following measurements can be taken:

- Distance from the anterior border of the mandible to the centre of the mental foramen.

- Length and width of the mental foramen.

One can determine the aspect ratio of every foramen by dividing its length by its width. With values more than one suggesting an elongated or oval shape and values less than one indicating a circular or round shape, the aspect ratio will reveal information on the shape of the foramen.

DETAILED METHOD OF STUDY:

In the present study, the following parameters were measured and analysed on mental foramen:

- Distance from the lower border of mandible.
- Situational variability.

  A. Distance from the lower border of mandible: The distance from the inferior margin of mental foramen to the lower border of mandible was measured.

  B. The situational variability of the mental foramen was recorded. The relation of mental foramen with the lower teeth (the position of the mental foramen was recorded as lying in line with the long axis of a tooth or interdental space) was classified in one of the following positions (Tebo & Telford, 1950)

Totally, 66 dry adult human mandible of known sex 30 females and 36 males were obtained from Department of anatomy Santosh medical college, Ghaziabad (U.P.) getting permission from head of the institution and departmental heads, formed the material for study.

To be observed the position, shape of MTF. To measure the distance of MTF (in mm) from various landmarks including symphysis menti, alveolar crest, posterior border of the ramus of mandible, and lower border of mandible with digital Vernier caliper and calculate the size of mental foramen.

MTF-AC: distance from alveolar crest to upper margin of mental foramen.

MTF-MB: distance from lower border of mandible to lower margin of mental foramen.

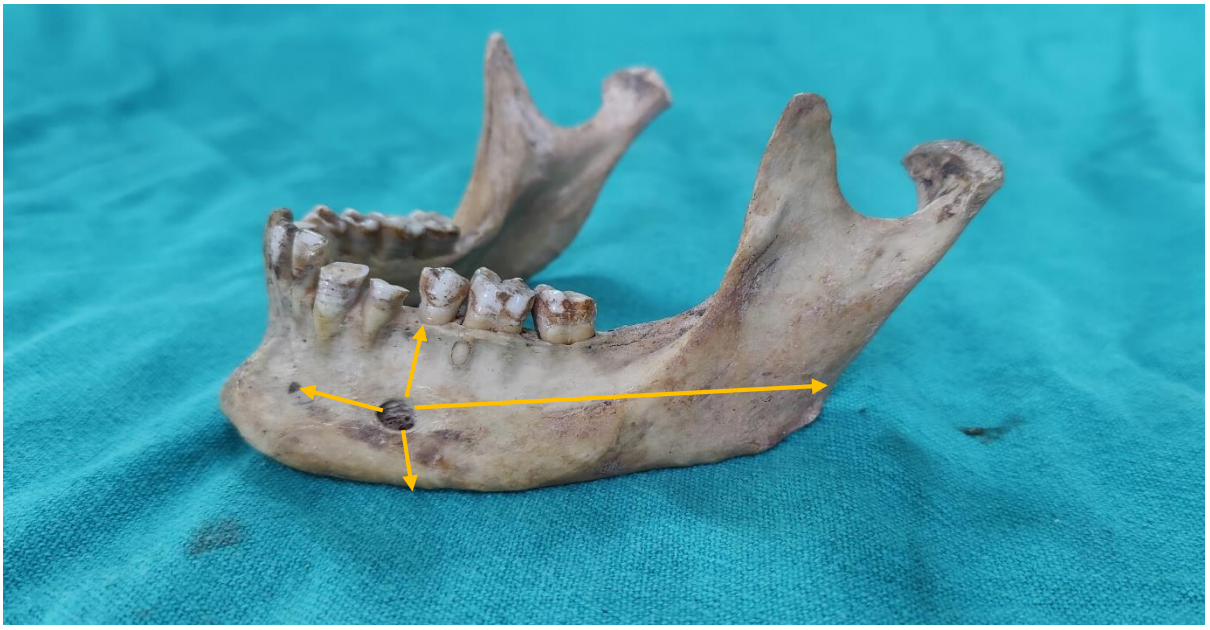
AC-MB: distance from alveolar crest to lower border of mandible.

MTF-SM: distance from symphysis menti to medial margin of mental foramen.

MTF-PB: distance from posterior border of ramus of mandible to lateral margin of mental foramen.

MTF-APM: Mental foramen distance from Apex of pre molar teeth.

Relation of mental foramen to the body of mandible.



A: point at alveolar crest lying on a longitudinal axis with mental foramen;

B: point at lower border of mandible lying on a longitudinal axis with mental foramen;

C: point at upper margin of mental foramen;

D: point at lower margin of mental foramen;

W: point at symphysis menti lying on a transverse axis with mental foramen;

X: point at posterior border of ramus lying on a transverse axis with mental foramen;

Y: point at medial margin of mental foramen;

Z: point at lateral margin of mental foramen.

RESULTS

ANALYSIS AND INTERPRETATION

DATA ANALYSIS AND INTERPRETATION FOR MENTAL FORAMEN (MTF):

Microsoft Excel was used to analyses the data that was supplied regarding mental foramen (MTF). Numerous statistical results, such as frequency tables, descriptive statistics, and pie charts, were used to examine the data presented on the mental foramen (MTF). The gender, mental foramen (MTF) shape, and position distributions are assessed using frequency tables.

The results of the frequency tables were supported by pie charts which are necessary in providing visual impression over the distribution of certain parameter. Descriptive statistics was also carried out to enhance description of the reported mental foramen (MTF) dataset in terms of mean, range, and standard deviation. Additionally, the independent t-test analysis was conducted to investigate whether there is significant mean difference between the mental foramen (MTF) measurements and gender (male and female).

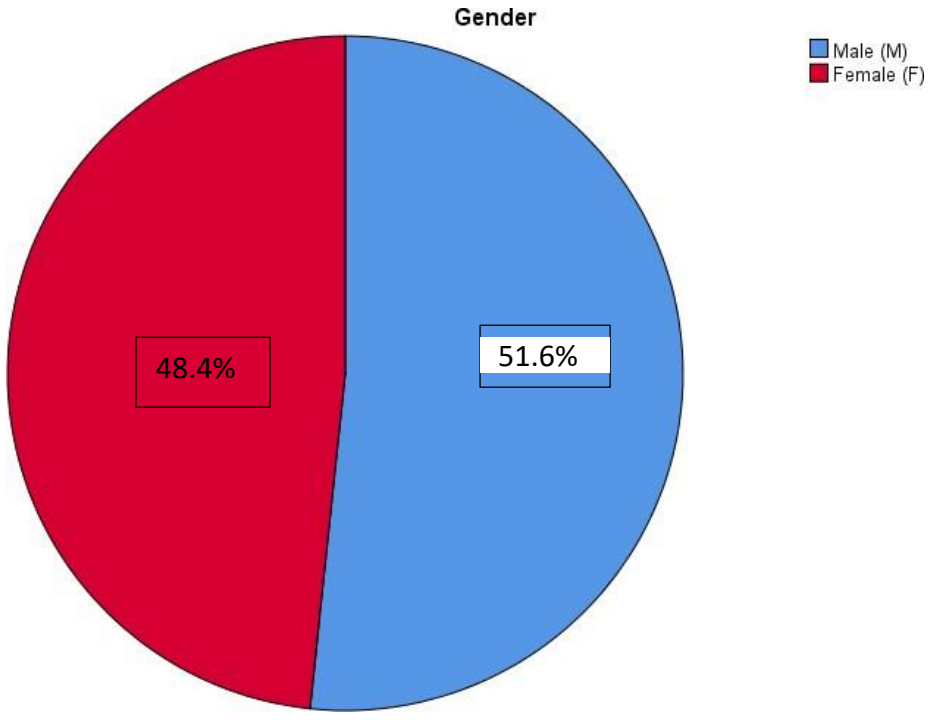
Frequency distribution on Gender

Table 4.1. Gender wise distribution of the sample

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male (M)	34	51.6	51.6	51.6
	Female (F)	32	48.4	48.4	100.0
	Total	66	100.0	100.0	
Total		66	100.0		

The frequency table on gender indicates that most of the mental foramen (MTF) reported from the male gender with a frequency of 34 (51.6%) against the femalesthat comprise a frequency of 32 (48.4%). This distribution is also supported by thepie chart on gender.

Figure-4.1. Gender-wise distribution of the sample



Frequency distribution on Mental Foramen

Table 4.2. Overall frequency distribution of MTF

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Right (R)	66	50.0	50.0	50.0
	Left (L)	66	50.0	50.0	100.0
	Total	132	100.0	100.0	

The frequency table on MTF indicates that the mental foramen (MTF) reported from the right side are the same from the ones from the left side with an equal frequency of 66 (150%). This distribution is clearly supported by the MTF pie chart.

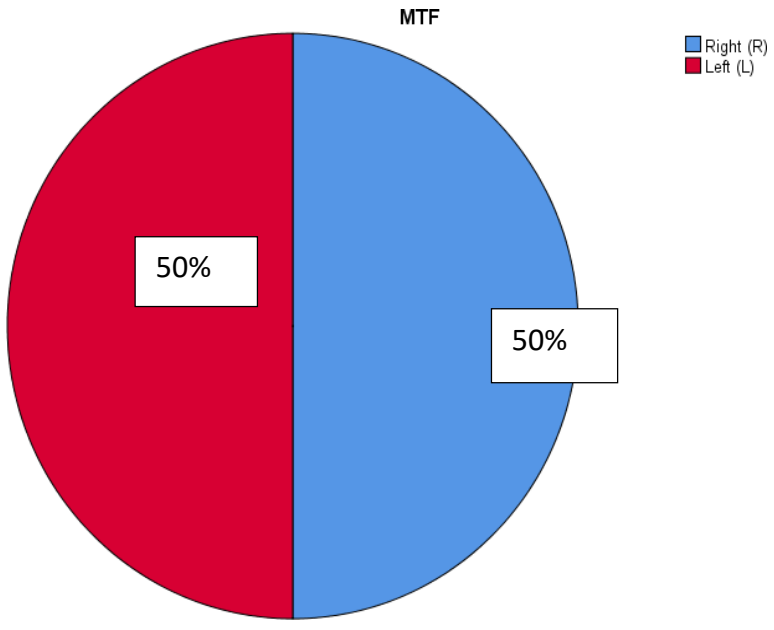


Figure 4.2 Graphical distribution of MTF among the study samples

4.4. Frequency distribution on Mental Foramen Position

Table 4.3. Frequency distribution of MTF Position in two sides (Right and Left) of mandibles

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Below 2nd premolar tooth (PMT)	70	53.0	53.0	53.0
	Between 1st and 2nd PMT	30	22.7	22.7	75.7
	Between 2nd PMT and 1st MT	20	15.1	15.1	90.8
	Below 1st PMT	12	9.2	9.2	100.0
	Total	132	100.0	100.0	

The frequency table on the distribution of the mental foramen (MTF) position sh**ow**s that most of them are below the second premolar position with a frequency of 70 (53.0%). However, the mental foramen (MTF) reported from the position of below first PMT are the least with a frequency of 12 (9.2%). This distribution of mental foramen (MTF) position is supported by the pie charts concerning the MTF positions.

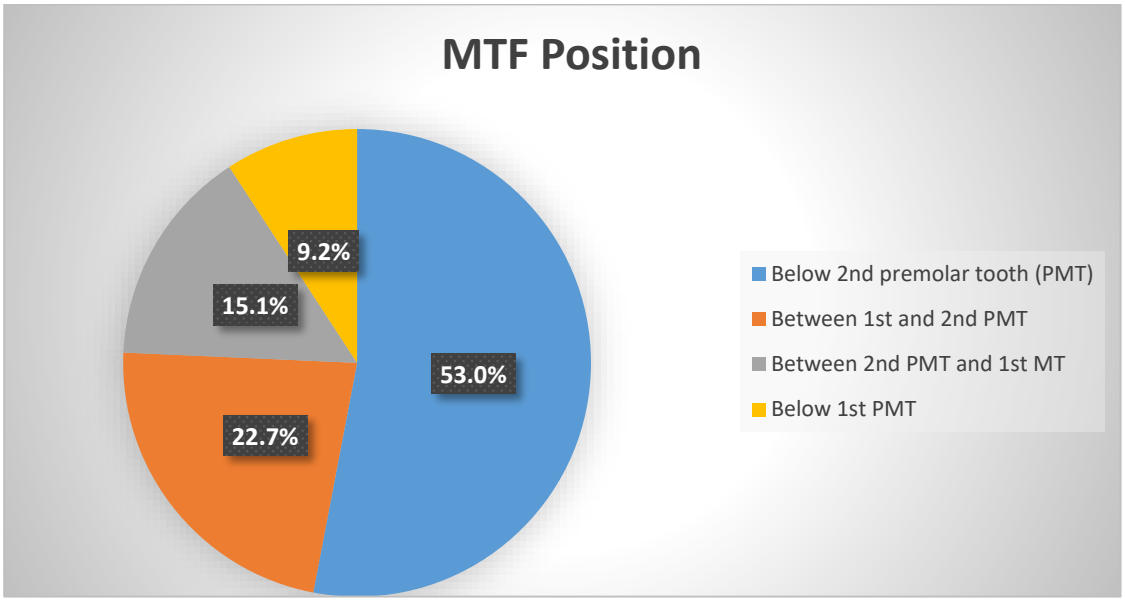


Figure 4.3 Graphical representation denoting the overall frequency of MTF position among the samples

4.4. Frequency distribution on Mental Foramen Shape

Table 4.4 Frequency distribution of Shape of MTF (Right and Left side) of mandibles

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Round (R)	80	60.6	60.6	60.6
	Oval (O)	52	39.4	39.4	100.0
	Total	132	100.0	100.0	

Table 4.5. Comparison of Shape of Mental Foramen in Right and Left side of overall mandibles

MTF Shape	MTF Side			
	Right		Left	
	Count	%	Count	%
R	44	55.0%	36	45.0%
O	22	45.0%	30	55.0%
Total	66	100.0%	66	100.0%

The frequency table concerning the mental foramen (MTF) shape indicates that most of them are round with a frequency of 80 (60.6%) against the one which are oval at afrequency of 52 (39.4%).

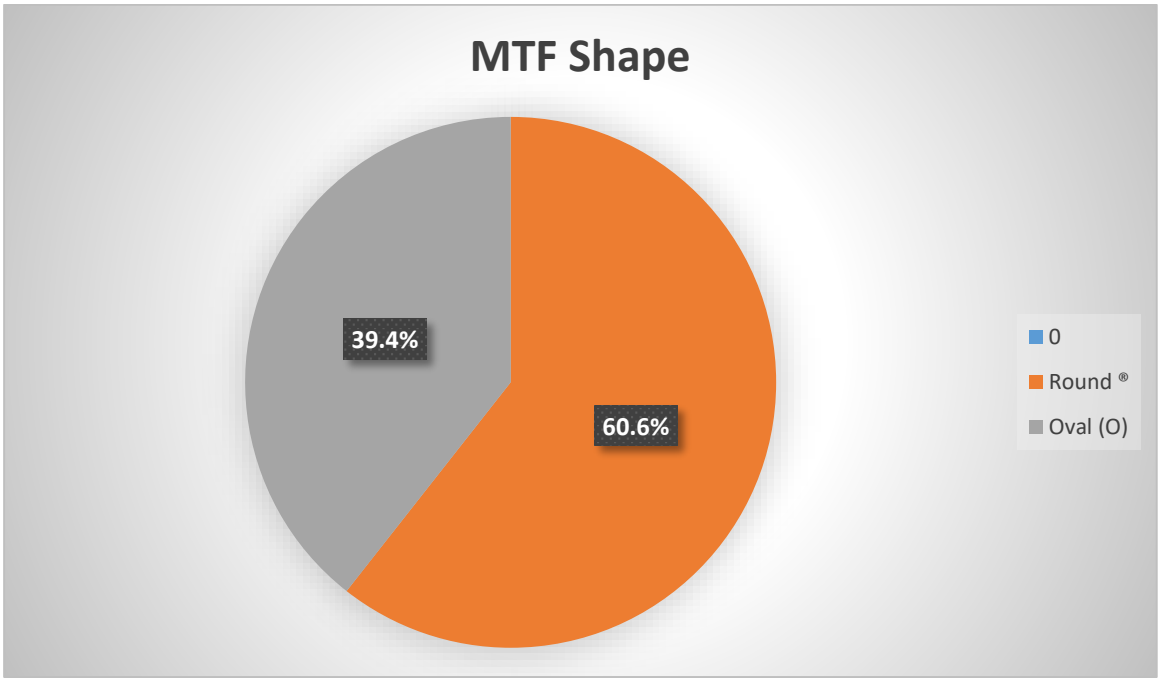


Figure 4.4 Graphical representation denoting the overall frequency of MTF shape among the samples

Descriptive Statistics on Mental Foremen Measures

Table 4.7. Descriptive Statistics on Mental Foremen of overall mandibles

Descriptive Statistics						
Side		N	Minimum (mm)	Maximum (mm)	Mean	Std. Deviation
Right	MTF to AC	66	9.00	20.40	13.6817	2.02252
	MTF to PB	66	56.10	75.80	65.1120	4.34023
	MTF to MB	66	10.40	15.90	13.1723	1.26261
	MTF to SM	66	21.30	31.10	25.4047	1.94697
	AC to MB	66	13.50	37.30	28.4460	2.65813
	Distance from APM	66	-5.30	8.60	2.6557	1.70649
	Valid N (list wise)	66				
Left	MTF to AC	66	7.30	14.80	13.8103	2.240
	MTF to PB	66	54.40	74.40	65.2867	4.19286
	MTF to MB	66	9.90	17.20	13.2373	1.46171
	MTF to SM	66	20.50	32.10	25.5643	2.16908
	AC to MB	66	11.70	37.30	28.1320	2.97663
	Distance from APM	66	-5.70	9.30	2.7697	1.76235
	Valid N (list wise)	66				

Descriptive Statistics was conducted on all the six measurements of in terms of mean, range, and standard deviation. The value of standard deviation for MTF to PB variable is high at 4.26 thus implying that the values are sparsely distributed away from the mean. On the other hand, the output of the other variables is low rangingbetween 1and 2 thus implying that their values are dispersed closer to the means.

The graph on the mental foramen standard deviations is as shown below:

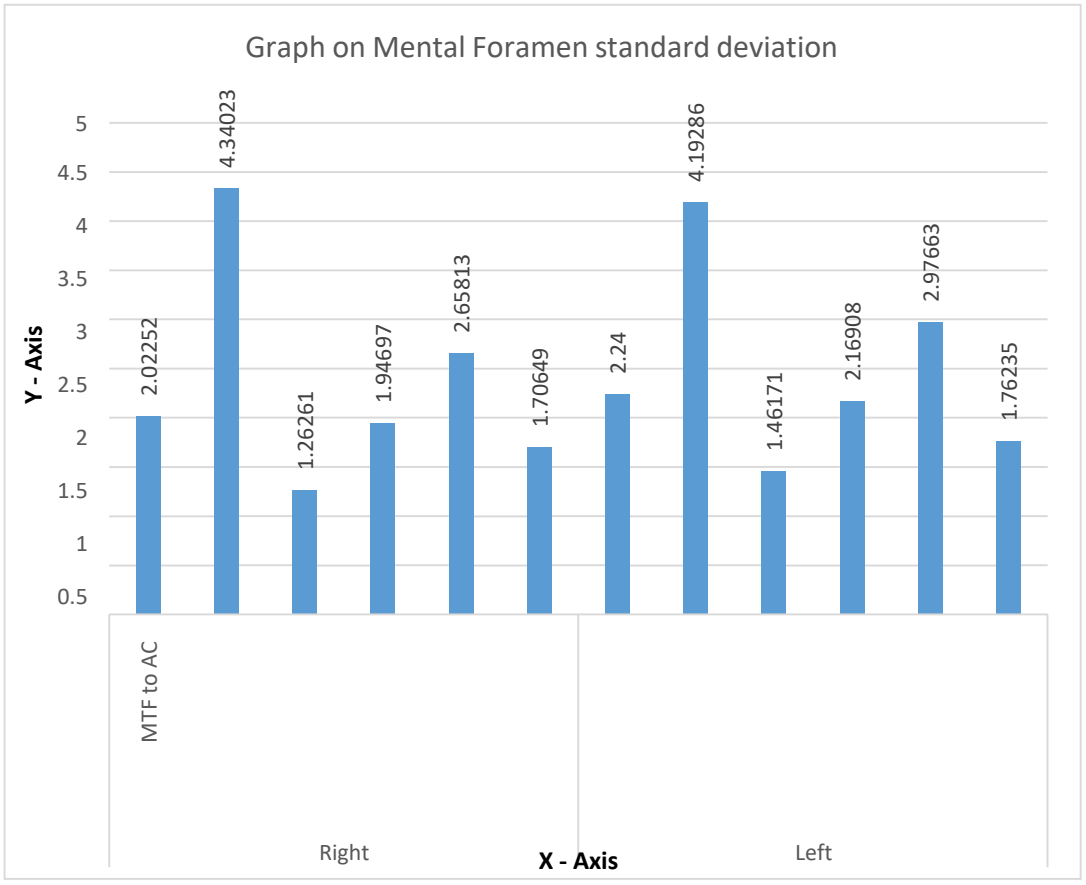


Figure 4.5. Graph on Mental Foramen with respect to anatomical locations (represented as SD)

Independent Sample T-test for assessing the degree of significance for MTF across different variables

Group Statistics for determining the degree of significance of MTF across different anatomical variables

	MTF Shape	N	Mean	Std. Deviation	Std. Error Mean
MTF to AC	**Round (R)**	80	13.453	2.0721	.0951
	Oval (O)	52	13.811	2.0488	.1840
MTF to PB	**Round (R)**	80	65.178	4.1543	.1906
	Oval (O)	52	65.256	4.6871	.4209
MTF to MB	**Round (R)**	80	13.203	1.3410	.0615
	Oval (O)	52	13.206	1.4626	.1313
MTF SM	**Round (R)**	80	25.450	2.0460	.0939
	Oval (O)	52	25.614	2.1283	.1911
AC MB	**Round (R)**	80	28.264	2.8086	.1289
	Oval (O)	52	28.405	2.8937	.2599
DISTANCE FROM APM	**Round (R)**	80	2.657	1.7166	.0788
	Oval (O)	52	2.917	1.7950	.1612

The results of the Independent Sample T-test provide information about the means, standard deviations, and standard error means for different groups based on MTF shape (Round vs. Oval). For MTF to AC, the mean measurements for Round (R) and Oval (O) shapes were 13.453 and 13.811, Respectively. The standard deviations were 2.0721 and 2.0488 for Round and Oval shapes, respectively, and the standard error means were 0.0951 and 0.1840 for Round and Oval shapes, respectively.

For MTF to PB, the mean measurements for Round and Oval shapes were 65.178 and 65.256, respectively. The standard deviations were 4.1543 and 4.6871 for Round and Oval shapes, respectively, and the standard error means were 0.1906 and 0.4209 for Round and Oval shapes, respectively. For MTF to MB, the mean measurements for Round and Oval shapes were 13.203 and 13.206, respectively. The standard deviations were 1.3410 and 1.4626 for Round and Oval shapes, respectively, and the standard error means were 0.0615 and 0.1313 for Round and Oval shapes, respectively. For MTF-SM, the mean measurements for Round and Oval shapes were 25.450 and 25.614, respectively. The standard deviations were 2.0460 and 2.1283 for Round and Oval shapes, respectively, and the standard error means were 0.0939 and 0.1911 for Round and Oval shapes, respectively.

For AC-MB, the mean measurements for Round and Oval shapes were 28.264 and 28.405, respectively. The standard deviations were 2.8086 and 2.8937 for round and oval shapes, respectively, and the standard error means were 0.1289 and 0.2599 for Round and Oval shapes, respectively. For distance from APM, the mean measurements for round and oval shapes were 2.657 and 2.917, respectively. The standard deviations were 1.7166 and 1.7950 for Round and Oval shapes, respectively, and the standard error means were 0.0788 and 0.1612 for Round and Oval shapes, respectively.

DISCUSSION

DISCUSSION

The inquiry that has been carried out thus far has been thoroughly examined, compared, and discussed in detail with other literary sources in the paragraphs that will follow. The majority of mental foramen (MTF) were reported from males, with a frequency of 34 (51.6%), compared to the 32 (48.4%) reported from females, according to the frequency distribution and gender pie chart analysis of the sample group. The present discovery aligns with earlier studies that examined variations in gender regarding the location and occurrence of the mental foramen. These factors, which have a significant impact on the anatomical variance, could be the primary cause. The anatomical variation of the mental foramen, which is the opening on the mandible through which nerves and blood vessels pass, can be influenced by several factors, including gender. The reason for this difference in gender can be attributed to various anatomical and physiological factors.

- Hormonal influence: The development of anatomical structures, including the mandible, is largely dependent on hormones. The position and size of the mental foramen are two aspects of the mandible's growth and maturation that can be influenced by hormones like oestrogen and testosterone, which are present in differing amounts in males and females.
- Skeletal morphology: Because of variations in skeletal morphology, the mandibles of males and females are shaped differently. The size and

  Placement of the mental foramen may differ in males and females since, for instance, males usually have a larger and stronger jaw.

- Genetic factors: The anatomical variance of the mental foramen can also be influenced by genetic factors. Different genetic features or predispositions may be more prevalent in males or females, influencing how the mandible develops and where the mental foramen is located.
- Sexual Dimorphism This term describes the physical differences between males and females within the same species. In humans, sexual dimorphism can influence various anatomical features, including the mandible and the mental foramen. These variations may result from evolutionary adaptations linked to reproduction, feeding, or other biological functions.
- Environmental factors: The development of the mandible and the location of the mental foramen can also be influenced by environmental variables, including diet, growth patterns, and mechanical stress. Variations in eating patterns and oral health behaviours, and additional environmental elements that differ between men and women may contribute to the mental foramen's anatomical diversity.

These results need to be confirmed by more studies with larger sample sizes and over a wider range of demographics in order to fully comprehend the implications for dental and medical operations. Together with the findings of earlier studies, the examination of the frequency distribution and pie chart in this study raises the possibility that gender variations exist in the position and frequency of the mental foramen. To validate these results and gain a better understanding of the consequences for dental and medical operations, more study with bigger sample sizes and across different age groups is required.

Table shows that the majority of the MTF positions were located below the second premolar tooth (PMT), with a frequency of 70 (53.0%). The second most common position was between the first and second PMT, with a frequency of 30 (17.0%). The position between the second PMT and the first molar tooth (MT)

had a frequency of 60 (10.0%), while the position below the first PMT had the lowest frequency of 23 (3.8%). It is interesting to note that the MTF position is important in clinical dentistry, as it is a crucial landmark for administering local anaesthesia to the mandibular teeth. Knowledge of the distribution of MTF position can help dentists avoid potential nerve damage during anaesthesia administration.

The accompanying graphical representation, which amply demonstrates that the bulk of the MTF sites were situated below the second PMT, supports the frequency distribution that is displayed in the table. It is crucial to remember that the distribution of MTF position may differ among groups and that the sample employed in this study may not be typical of the total population.

This result is consistent with earlier studies that examined the physical features of the mental and mandibular foramen, reporting gender-specific differences in their position, shape, and size. Research has indicated, for instance, that men typically have a larger mental foramen than women, and that the location of this foramen may vary between genders, with men having a larger one and women having a larger one. But more investigation is required to validate and comprehend these gender-related variations better. [35]

According to a report on the frequency distribution analysis of the shape of the mental foramen (MTF), round MTFs constituted the majority of MTFs, with a frequency of 80 (60.6%), whereas oval MTFs were less common, with a frequency of 52 (39.4%). One common anatomical variety that has been documented in the literature is the circular form of the mental foramen. The mental nerve and arteries are said to flow via this mandibular aperture, which is sometimes characterized as circular or almost circular. Due to the mandible's

ossification process and embryological growth, which can produce a circular or nearly circular shape, it is thought that the round shape is more prevalent.

Oval-shaped mental foramen, on the other hand, is thought to be a less common variation. It is common to characterize oval-shaped mental foramina as having an extended form with a longer horizontal axis. A number of reasons, including developmental abnormalities, trauma, or pathological disorders affecting the mandible, might result in the oval form.[36]

It's important to remember that, especially in dental and surgical operations, the form of the mental foramen can have clinical ramifications. For instance, the position and form of the mental foramen can have an impact on the safety and effectiveness of a local anesthetic injection. Furthermore, in implant dentistry, the orientation and positioning of dental implants may be influenced by the form of the mental foramen.

It is imperative to acknowledge that there may be variations in the occurrence and configuration of mental foramen among distinct demographics, ethnic groups, and people. To fully understand the variations in mental foramen form and their possible therapeutic implications, more study with bigger sample sizes and various groups is therefore imperative. In summary, the round form of the mental foramen is more prevalent than the oval shape in the sample population, according to the examination of the frequency distribution of this shape. This result is in line with the literature's overall portrayal, which states that round-shaped mental foramens are the more common type. To fully comprehend the changes in the morphology of the mental foramen and their clinical implications, more research is necessary.

The anatomical characteristics of the mental foramen (MTF) have been well established in earlier work on the anatomy of the mandible and mouth cavity. The mental nerve, which branches from the trigeminal nerve, provides sensory innervation to the lower lip and chin. It exits the mandible via the mental foramen, a small opening usually found in the region of the premolars. Conversely, the ridge-like structure on the mandible that contains the tooth sockets is referred to as the alveolar mandibular process..[3738]

The position, size, shape, and variations of the alveolar mandibular process and mental foramen in various age groups, genders, and populations have been researched by anatomists and researchers. Their clinical significance in a range of dental and surgical treatments have also been examined. The morphology and size of the alveolar mandibular process, for instance, may have an effect on the insertion of dental implants or the treatment of mandibular fractures. Similarly, the location of the mental foramen is significant when it comes to avoiding nerve damage during local anaesthesia administration for dental procedures.

As long as the distribution is symmetric and the bulk of the data points cluster around the mean, normal distribution analysis can determine whether the obtained data follows a normal distribution, which is necessary for drawing reliable statistical conclusions. Numerous statistical tests presume that the data is distributed normally; hence, deviations from normalcy may affect the reliability of the statistical findings. Thus, to ensure the validity of the results and the appropriate application of statistical tests, it is crucial to verify that the data pertaining to the mental foramen and alveolar mandibular process have a normal distribution.[39]

With regards to the measurement of MTF with respect to the gender-based outcomes were assessed. The t-test result shows that there is a statistically significant difference between gender (males and females) and all of the Mental Foramen measurements. This result is in line with earlier research on the anatomical variations in the mandibular region between males and females. Prior research has documented sexual dimorphism in a number of mandibular physical characteristics, such as the location and size of the mental foramen.

For instance, research by Coquerelle et al[40]. And Iwanaga et al[41]. Has demonstrated that, in comparison to females, males often have larger and more superiorly positioned mental foramen. This may be explained by variations in the hormonal impacts that occur throughout development or by genetic variables that affect the growth of the mandible.

The idea of sexual dimorphism in the mandibular region is supported by the significant difference in the t-test between the measurements of the Mental Foramen and gender (males and females), particularly with regard to the location and dimensions of the Mental Foramen and the size and morphology of the Alveolar Mandibular Process.

It's important to consider that these conclusions should be viewed in light of the study's limitations, as they are derived from the statistical analysis of the collected data. A more thorough understanding of the morphological variations between boys and females in the mandibular area may be possible with bigger sample sizes and the inclusion of pertinent variables including age, ethnicity, and environmental effects. However, the present findings offer insightful information about the possible sexual dimorphism in the alveolar mandibular

process and mental foramen, which may have consequences for clinical practice in dental implantology, oral surgery, and forensic anthropology.

An important anatomical parameter in dentistry and oral surgery is the individual distance from the mental foramen (MTF) to various anatomical locations, including the Apex of Pre-Molar (APM) teeth, the middle of the body of the mandible (MB), the anterior border of the ramus (AC), the posterior border of the ramus (PB), and symphysis menti (SM). It has important clinical ramifications for a number of dental operations, including implant insertion, orthognathic surgery, nerve block anaesthesia, and third molar extraction.

Research in the literature has demonstrated that there can be significant individual variances in MTF measurements to other anatomical landmarks. It is imperative to comprehend these variations in order to achieve the best possible clinical outcome. With standard deviation values ranging from 1 to 4.26, the descriptive statistics (mean, range, and standard deviation) in the data demonstrate the variety in these measurements. While the values of the other variables are more narrowly distributed around the mean, the larger standard deviation number for MTF to PB indicates that this measurement has greater variability and is more sparsely distributed away from the mean.

Several previous studies have investigated the relationship between MTF and other anatomical landmarks[42]. For example, studies have indicated that the distance between MTF and AC plays a significant role in dictating the effectiveness of inferior alveolar nerve block anaesthesia, a typical anaesthetic utilized in mandibular dentistry treatments. It has also been discovered that the distance between MTF and PB plays a role in determining the likelihood of neurosensory abnormalities following the excision of the mandibular third

molar. Furthermore, the separation between MTF and MB and SM can affect how dental implants are positioned in the mandible, and MTF and APM distances are crucial for figuring out how close the mental nerve is to implant sites.

Clinicians can make more educated judgments when planning and carrying out different dental operations by having a thorough understanding of the differences and relationships between MTF and other anatomical landmarks. It can help to ensure patient safety, maximize treatment success, and reduce the chance of problems. As a result, the data's descriptive statistics as well as the literature review of earlier studies emphasize the clinical value of individual distance measurements from MTF to other anatomical regions in dental practice.

Depending on whether the mental foramen (MTF) is oval or round, the results of the Independent Sample T-test reveal the mean values, standard deviations, and standard error means for each measurement. These results can be used to evaluate and determine whether there are statistically significant variations in the measurements of the Round and Oval MTF forms.

When interpreting the findings, it's critical to take the study's particular setting and research issue into account. According to the information given, it looks as though there might be a small variation in the mean measurements between the Round and Oval MTF forms for certain variables, such MTF to AC and AC MB, but the variation is not evident for all variables.

CONCLUSION

CONCLUSION

These results may have consequences for dentists when scheduling dental operations that involve the mental foramen region, as well as for adding to the body of knowledge already available on the anatomy of the mental foramen.
To validate these results and investigate potential influences on the correlations between these variables, more investigation is necessary. It's also critical to evaluate these findings in light of the particular sample and population that were examined, as well as any other pertinent variables that might have an impact on the measurements and anatomy of the mental foramen. Based on our comprehension of the connections between mental foramen and mandibular measurements in the population sample from northern India, our work has demonstrated the necessity for further investigation from an anatomical perspective and has therapeutic relevance.

For the purpose of validating and generalizing these results, more research with bigger sample sizes and a more varied population may be necessary. Furthermore, taking into account additional factors like age, gender, ethnicity, and general health state may offer a more thorough comprehension of the intricate structure and variety of the cerebral foramen.

Overall, knowledge and comprehension of the consequences of mental foramen measurements in clinical practice can be improved by merging the findings of several research and taking into account the limitations and generalizability of the data. In addition to advancing our understanding of oral anatomy, more study and research in this field can help with treatment planning and patient care.

Recommendations

- These discoveries are clinically significant for dental treatments, inferior alveolar nerve blocks, maxillofacial, head and neck surgery, dental implants, and radiation therapy. All of the aforementioned findings were linked to the other authors' published material.
- Research also contributes to our understanding of the differences between the male and female forms of the mental foramen.

Future Scope of the Study

To put the results in perspective, it's also critical to compare the outcomes with previous research, if any is available. To ascertain the importance of the observed differences and make intelligible conclusions, more statistical analysis—such as inferential statistics—may be required. Correct interpretation of the data also depends on taking into account the sample size (N) and other pertinent elements, such as the study design and any confounding variables.

Comprehending the variations between genders in the incidence and physical attributes of the mental foramen may have consequences for dental and medical operations, including the use of local anaesthetic, the positioning of implants, and the danger of nerve injury. It's crucial to remember, though, that these conclusions might only apply to some communities or ethnic groups and might not be applicable to others. Therefore, in order to confirm these results and offer more thorough insights into the field of mental foramen studies, more research with bigger sample sizes and across a wider range of individuals is necessary.

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ANNEXURES

LETTER OF ETHICAL CLEARANCE FOR DISSERTATION FROM REGISTRAR OFFICE

SANTOSH
Deemed to be University
(Established u/s 3 of the UGC Act, 1956)

F. No. SU/R/2024/1344[1] Dated: 17.05.2024

Subject: Grant of Ethical Clearance for **Dissertation Protocol** Topic **"Mental Foramen Utilizing Various Assessment Parameters"**, submitted by **ANJALI JANGID,** student of M.Sc. Medical Anatomy, 2021 Batch.

*****

With reference to the request for grant of Ethical Clearance for the Dissertation Protocol entitled **"Mental Foramen Utilizing Various Assessment Parameters"**, **ANJALI JANGID** is informed that the **Dissertation Protocol** submitted by him/her was considered by the **Screening Committee** of the **Allied Health Sciences** in its meetings held on 07.02.2024 and 29.02.2024. The recommendations of the **Screening Committee** were considered in detail by the **Institutional Ethics Committee** in its meeting held on **15.05.2024** and the same was **approved** by the **Ethics Committee** of the **Santosh Deemed to be University, Ghaziabad, Delhi NCR.**

He /She is informed accordingly for further necessary action.

17/5/24

[Dr. EZHILRAJAN. K]
REGISTRAR

REGISTRAR

ANJALI JANGID
M.Sc. Medical Anatomy.

Copy to:

1. The Vice Chancellor
2. The Dean – Academics
3. The Dean, SMC&H
4. The Dean – Research
5. The Director - IQAC
6. HOD/ Course In-charge of the concerned Department.

STASTICIAN CERTIFICATE

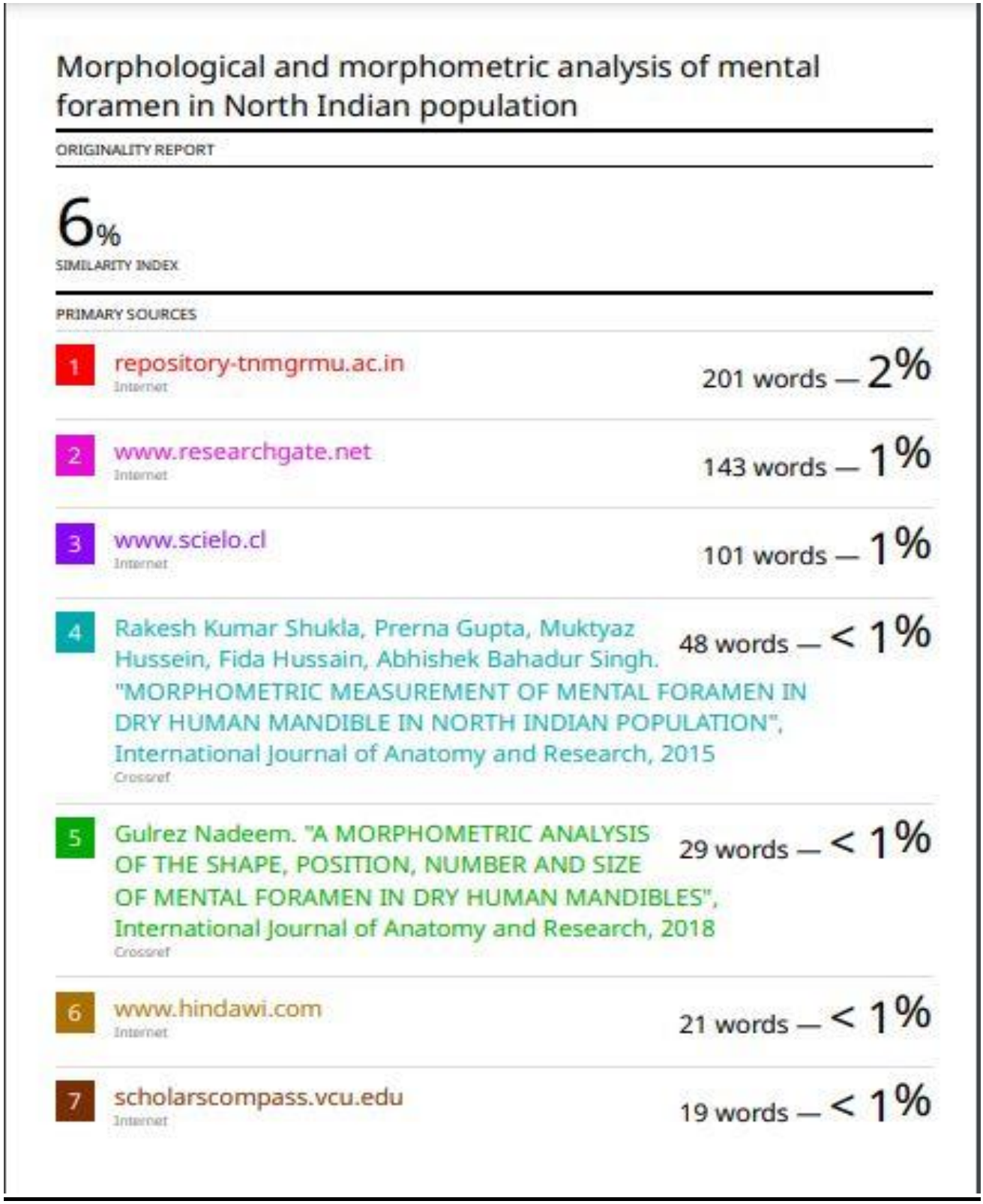
This is to certify that the statical analysis component of the thesis titled "**MORPHOLOGICAL AND MORPHOMETRIC ANALYSYS OF MENTAL FORAMEN UTILIZING VARIOUS ASSESSMENT PARAMETERS IN DRY HUMAN MANDIBLES FROM NORTH INDIA**" done by **Dr. Anjali Jangid** in the Department of Anatomy Santosh Medical College and Hospital, Ghaziabad, has been conducted under my guidance and supervision.

All the statistical calculations of the study are authentic and correct to best of my knowledge.

Wish her all the success in her life.

Dr. Amod Kumar Chaudhary, PhD
Assistant professor cum statistician,
Department of community medicine,
Santosh Deemed to be University, Ghaziabad, 201009.

PLAGIARISM CERTIFICATE



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